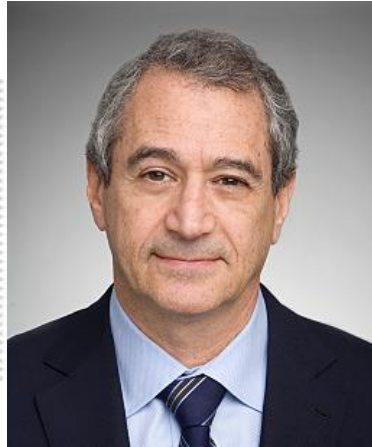# Staking Your Claim to AI & ML Innovations

ARTIFICIAL INTELLIGENCE, MACHINE LEARNING AND ROBOTICS

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Artificial Intelligence, Machine Learning and Robotics

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DISTINCTIONS

HOW DOES MACHINE LEARNING DIFFER FROM TRADITIONAL SOFTWARE?

- Traditional software requires hand-coding with specific instructions to complete a task

- An ML system **learns to recognize patterns** and **to make predictions** using large amounts of data, **building a mathematical model based on sample data (i.e., training data)**

EXAMPLE:

- Spam the old way: "if the email contains the word 'Viagra,' then …"

- Spam the new way: ML system learns from training data to identify if email is spam

Machine Learning

TWO BRANCHES

SUPERVISED

- Currently most common

- Algorithms must be trained to produce the model

- Outcome is difficult to predict

- Data-driven development is an iterative prototyping process
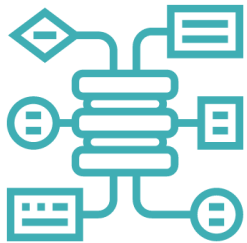
UNSUPERVISED

- Less commonly developed

- No human training of the algorithm

- Algorithm uses its own binary logic

- Continuously learns

- Requires much more data

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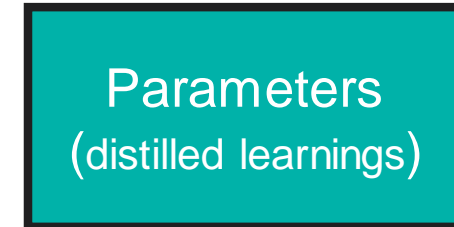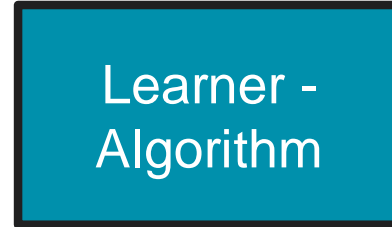
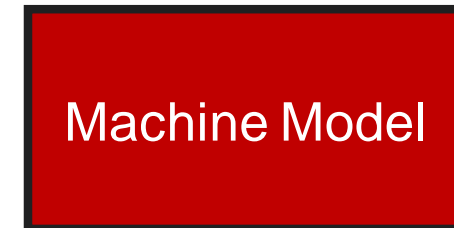# How is a Supervised Machine Learning Model Developed?

Identifies Features
(E.g., country of origination, time sent)

Input (E.g., Emails as training data)

Learner - Algorithm

Parameters (distilled learnings)

Output

Machine Model

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AI/ML and Subject Matter Eligibility

AS WITH OTHER INVENTIONS INVOLVING SOFTWARE, APPLICATIONS SHOULD:

✓ (a) focus upon subject matter eligibility from the outset, and

✓ (b) address (i.e., conform to) the judicial exceptions

- o Organizing Human Activity

- o Mental Processes

- o Mathematical Concepts

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Methods of Organizing Human Activity

| Fundamental Economic Activities | Commercial or Legal Interactions | Managing Behavior Relationships or Interactions |

- **Many AI / ML inventions at their core do not fall into one of these categories:**
  - Neural network architecture; expert systems; classification systems
  - Data processing; applied learning/training
  - Autonomous vehicles; smart devices; IoT; virtual assistants

- **BUT technology focused upon end results can be problematic:**
  - Recommendation systems
  - Productivity / Workflow solutions
  - Financial Transactions

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Mental Processes

> Concepts performed in the human mind

> Includes:

Observations | Evaluations | Judgments | Opinions

Beware about inadvertent mental steps that form part of your disclosure

- AI/ML is intended to imitate and simulate human behavior and decision-making processes

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Mathematical Concepts

> Broadly include:

Formulas | Equations | Calculations

> AI / ML often involve assigning weights, priorities, rank, or other discrete or statistical methods

- E.g., weighing activation of nodes; weighing probabilities of determination

Drafting Recommendations

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Proactively Address or Avoid the Judicial Exception Categories

- Where applications relate to **organizing human behavior,** focus on technical aspects and benefits rather than end results and business advantages.

- Technical aspects:

  - Normalization, training, use of the model

  - Include discussion about technical difficulties faced by existing technologies

  - Describe the practical or real-world application of the claims with specificity

  - Describe conditional and/or repetitive transformations of data with particularity

Drafting Recommendations – Mental Processes

## Distill Technical Solutions from Mental Processes

- Focus on technical aspects of behavioral and decision-making innovation that "could not, as a practical matter, be performed entirely in a human's mind" (disclose, at least implicitly, why pen and paper are insufficient)

- Watch for problematic technology areas: signal processing, normalization, etc.

- Connect AI/ML solutions to specific hardware components, but note that use of hardware on its own may not be enough

- Inclusion of the ML/NN model in the claim can be helpful

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Be Skeptical, But Don't Ignore Mathematical Concepts

- The PTO and PTAB typically take a narrow view on **mathematical concepts**, where claim elements explicitly recite the formula or mathematical algorithm

- Generally, recommend avoiding inclusion of formulas in the application (balanced against 112 requirements)

- But, consider necessity of including mathematical or pseudo-code algorithms within disclosure, or perhaps within an appendix
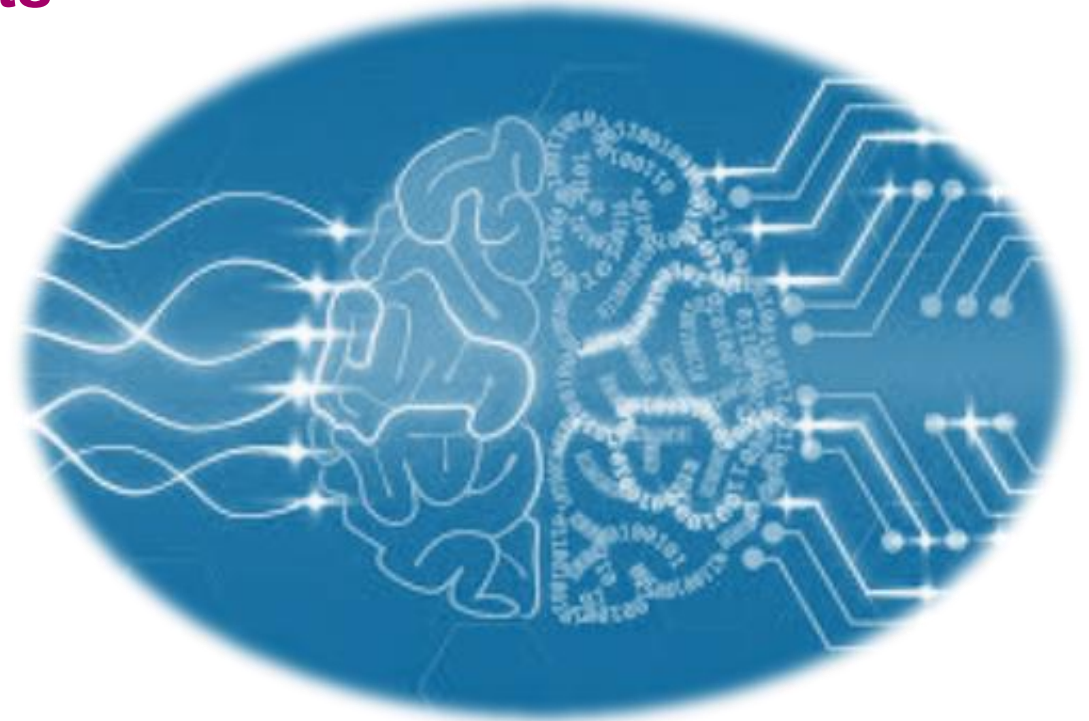
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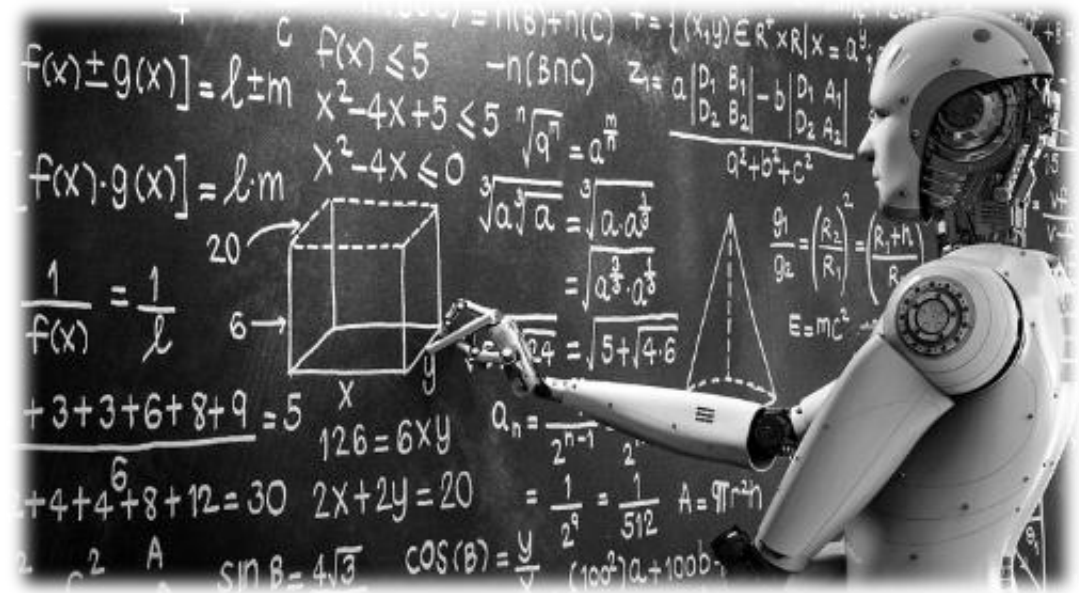
Uniqueness of AI/ML Inventions

Opaque Aspects of AI and ML Systems Are to Be Expected, Claim Other Aspects

- Gathering of data for model

- Preparation of data for training

- Training process / feedback loop

- Post-processing of results

- Practical applications of the model

Draft Competitively-Valuable Claims

Don't Forget About Detectability

- AI / ML solutions are often hidden

- Difficult to determine how a competitor might train models, how their hidden functionality works

- Consider including a claim addressing the practical application of the subject matter; focusing upon the best chance of reading on a competitor's solution (even if it's not your solution)

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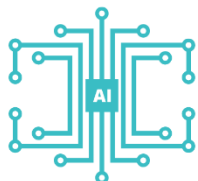
Recently Issued AI/ML Claims

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Exemplary "ML" Claims Issuing from the USPTO

Keyword Search (as of April 30, 2020)

Recently Issued Patents

Class 706; CPC sub-codes within G06N (typically resolving to AU 2124)
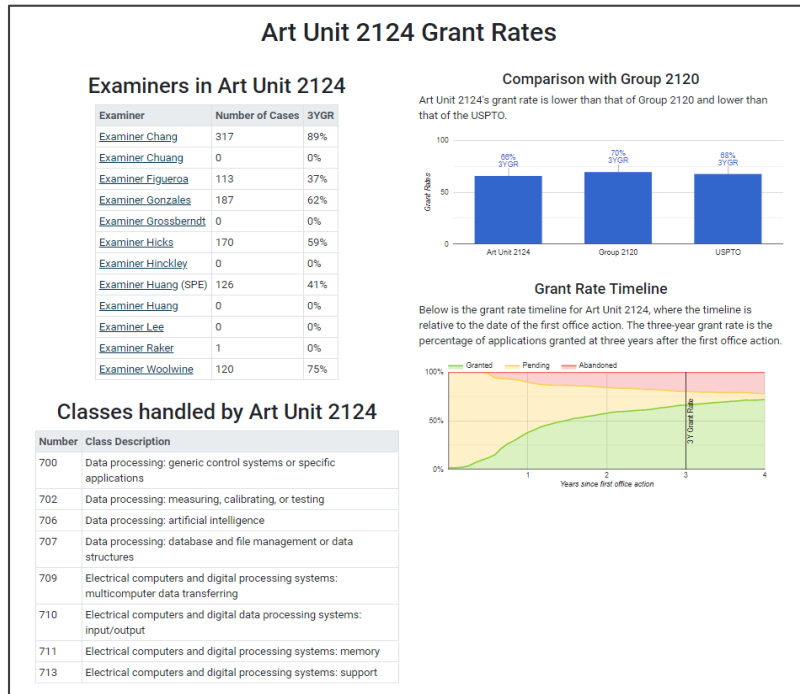
Patent Numbers/Assignees Redacted

Claims Abbreviated

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Where Does AI and ML "Live" at the USPTO?

ART UNIT 2124

Source: https://www.patentbots.com/stats/art-unit/2124

CLASS 706 (INCLD. SUBCLASSES)

Source: https://www.uspto.gov/web/patents/classification/uspc706/defs706.pdf

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Recently Issued ML Claims

CLAIMING THE CONFIGURATION AND TRAINING OF THE ML MODEL ITSELF

A computer implemented method comprising:

> **obtaining** a…**set of training data for each of a plurality of <u>machine learning tasks</u>;**

> for each of the machine learning tasks, **<u>configuring a respective teacher machine learning model</u> to perform the machine learning task <u>by training</u> the teacher machine learning model on the training data for the task**; and

> **<u>training a single student machine learning model …to perform</u> all of the plurality of <u>machine learning tasks</u> using (i) the configured teacher machine learning models, and (ii) the obtained training data,…:**

> for each of the plurality of machine learning tasks:…selecting one or more subsets…; …augmenting the subset …; **processing** the augmented subset using the student machine learning model **to generate a student machine learning model output**….

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Recently Issued ML Claims

CLAIMING THE PREPARATION OF TRAINING SETS

A machine learning system comprising:

> **>** a data storage storing data to be classified; and at least one processor to:

> **>** **receive a model building data set** including data from at least one data source;

> **>** **determine a machine learning model** from the model building data set;

> **>** **determine** a first set of **predictive variables to be used** in the machine learning model;

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Can a patent be granted on subject matter "conceived" by a machine?

In 2018 and 2019, Stephen L Thaler filed patent applications with the UK IPO, EPO, and the USPTO for inventions purportedly created by a machine (an AI) known as "DABUS".
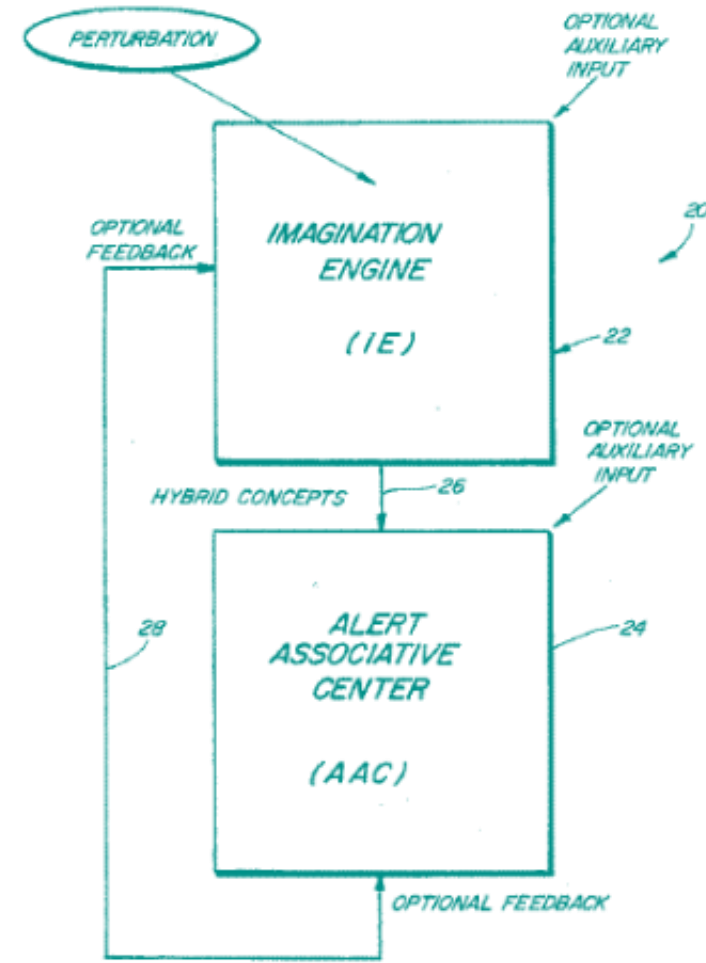
Thaler Patent Application

I, DABUS, claim...

1. A food or beverage container comprising:

a wall defining an internal chamber of the container, the wall having interior and exterior surfaces and being of substantially uniform thickness;

wherein the wall has a fractal profile with corresponding convex and concave fractal elements on corresponding ones of the interior and exterior surfaces; and

wherein the convex and concave fractal elements form pits and bulges in the profile of the wall.
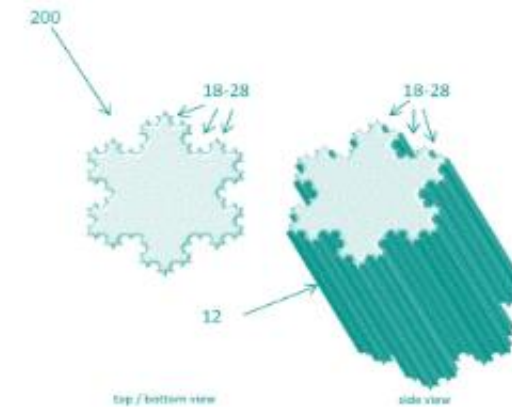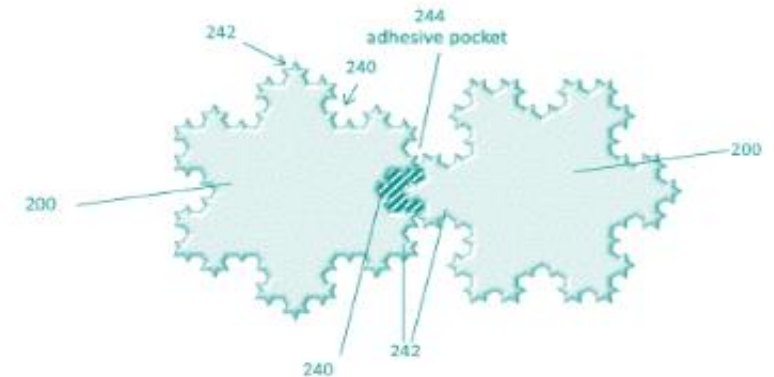

Fig. 6

Fig. 7

Thaler Patent Application

Thaler's applications named DABUS as the sole inventor. Thaler argued to the USPTO that an "inventor" should not be limited to natural persons, asserting that it was DABUS, not a person, "which recognised the novelty and salience" of the invention.

In rejecting Thaler's arguments, the USPTO pointed to 35 USC section 100(a), which defines "inventor" as "the *individual* or... *individuals*... who invented or discovered the subject matter of the invention.

The USPTO also cited section 101 of the statute, which begins with, "*Whoever* invents or discovers..."4 concluding that "whoever" suggests a natural person.
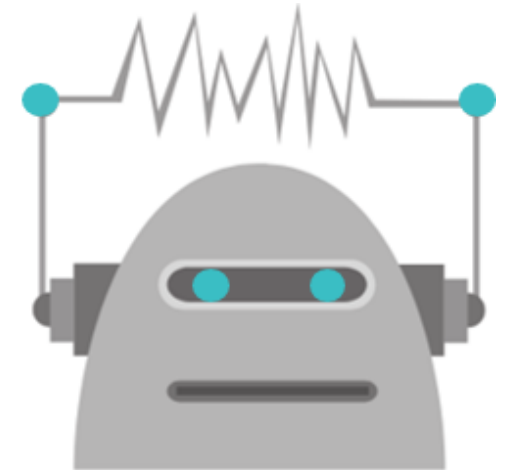
Thaler Patent Application

Are All Inventors Human? - Episode 1

Perpetual Motion Podcast

Colin Fowler and Michael Glenn interview Dr. Stephen Thaler, a pioneer in the field of AI. Thaler has invented "DABUS," an AI that he credits with inventorship on two patent applications filed in each of the U.S. and European patent offices. Thaler discusses the joys and difficulties of living with a creative AI.

Judgment Day

Intellectual Property Magazine

Jordan Becker, Colin Fowler, and Michael Glenn discuss whether patent rights should be obtainable for inventions "invented" by artificial intelligence.

What is DABUS?

The Simple Explanation

http://imagination-engines.com/iei_dabus.php

ARTIFICIAL INVENTORS

https://artificialinventor.com/dabus/

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CLE Code Word

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Questions?

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